3430 Evaluation

DEC 2 1 1983

Western Spruce Budworm

Forest Supervisors, Umatilla, Wallowa-Whitman, Malheur, and Ochoco NF's

Enclosed is a copy of the biological evaluation, "Western Spruce Budworm Egg Mass and Defoliation Survey in the Blue Mountains of Eastern Oregon, 1983."

This evaluation provides information on the current status of the western spruce budworm infestation which, in 1983, caused widespread defoliation for the third consecutive year in the Blue Mountains.

PAUL E. BUFFAM

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Forest Pest Management

Enclosure

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Mt. Hood NF
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BBHostetler:pjj 12/12/83

Hos.4

Western Spruce Budworm Egg Mass and Defoliation Survey in the Blue Mountains of Eastern Oregon, 1983

by

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Introduction

Western spruce budworm, *Choristoneura occidentalis* Freeman (WSBW), defoliation of true firs and Douglas-firs was detected on approximately 2.4 million acres (0.97 million hectares) in the Blue Mountains of eastern Oregon during the Annual Aerial Forest Insect Detection Survey in August 1983.

The areas of defoliation on National Forest, Bureau of Land Management, State and private lands were as follows:

Land Manager	Defoliation Acres (Hectares)
Malheur National Forest	850,840 (344,330)
Ochoco National Forest	349,060 (141,260)
Umatilla National Forest	286,300 (115,860)
Wallowa-Whitman National Forest	322,950 (130,700)
Bureau of Land Management	27,830 (11,260)
State and private	535,470 (216,701)

These defoliation figures include approximately 525,000 acres (212,500 hectares) which were treated with insecticides in 1983, but which still exhibited visible defoliation during the aerial survey.

The increase in defoliation of 0.9 million acres (0.36 million hectares) from 1982 to 1983 confirmed predictions of increasing WSBW populations in the Blue Mountains. This once again prompted the gathering of WSBW population information which would be useful to land managers when making decisions on managing the WSBW infestation in 1984.

During August and September 1983, crews visited areas in which defoliation was detected during the aerial survey to: (1) verify presence or absence of WSBW; (2) make appropriate adjustments to defoliation boundaries; (3) establish egg mass sample plots; and (4) estimate levels of current (1983) defoliation as well as that of 1982 and 1981. The objective of egg mass sampling was to estimate egg mass density and, from that, estimate potential for defoliation in 1984. Defoliation levels for 1981 through 1983 were determined to estimate the severity of previous defoliation. This in turn will help estimate the impact of any future defoliation.

Methods and Materials

Sampling was done within or adjacent to areas in the Blue Mountains showing 1983 defoliation. An egg mass plot consisted of at least 20 17.7-in (45-cm) branch tips (one per tree) at sites where defoliation was evident from the ground. At sites where defoliation was difficult to detect, 25 branch tips were collected. All trees sampled at a plot were either Douglas-fir or true fir. Branch tips were sampled using a polepruner with attached catchbasket from mid-crowns of trees 23 to 46 feet (7 to 14 meters) tall and from lower crowns of trees taller than 46 feet. All branch tips from a plot were placed in a cardboard box, transported to the laboratory, and held in a walk-in cooler until they could be examined.

Using the densities, 1984 defoliation levels were predicted for each plot site using a defoliation classification system adapted from Carolin and Coulter (1972). Defoliation classifications used were: light ($\leq$25 percent defoliation), moderate (>25 $\leq$ 50 percent), and heavy (>50 percent). Branch tips were examined one at a time for egg masses which were then separated into new (1983) and old (1982 or earlier) categories. Examination of branches from a plot continued until a density estimate could be made based on a sequential count plan developed by Srivastava and Campbell[1/].

Defoliation levels for 1983 were also estimated for each egg mass plot site by examining and classifying defoliation of 20 new shoots from each of the first five branch tips from 23- to 46-foot trees encountered during the egg mass examination process. Defoliation estimates were made using a 6-class index system: 1 = 0%; 2 = 1-25%; 3 = 26-50%; 4 = 51-75%; 5 = 76-99%, and 6 = 100%. Defoliation estimates for 1982 and 1981 were made by looking at each branch tip as a whole and determining a defoliation rating.

Defoliation estimates, in addition to those made for egg mass plot sites, were also made at a number of sites throughout the WSBW-infested areas to help characterize the current infestation.

Results and Discussion

Egg mass and defoliation plots were placed within or near areas with detectable WSBW defoliation with the exact locations of plots within an area being determined primarily by accessibility. Plots were sampled prior to the division of areas into smaller areas called analysis units (Figures 1-5) for use in conducting an environmental analysis of the situation. Thus, some of the analysis units shown in Table 1 have few or no plots within them.

Within or adjacent to the Malheur National Forest, 154 of 185 plots (83 percent) showed two or more years of moderate to heavy defoliation with all but three plots (98 percent) showing at least one year of moderate to heavy defoliation (Table 1). The average 1983 defoliation index for this area was 5.4, indicating that more than 75 percent of the current year's foliage was gone. Moderate to heavy WSBW defoliation for two or three years will begin to cause significant reductions in tree growth. Continuation of defoliation at this level for several more years may cause some top-kill and/or weaken trees so they are more vulnerable to decay fungi or other insects such as bark beetles.

1/ Srivastava, N., and R. W. Campbell. 1982. Sequential classification and count plans for populations of the western spruce budworm: egg masses, instar IV and pupae. Unpublished manuscript on file at Forestry Sciences Laboratory, Corvallis, OR 97331. 28 p. (typed).

At the plots in which egg masses were collected, 1984 defoliation levels were predicted to be moderate to heavy at 41 plots (59 percent) and light at 29 plots (41 percent) (Table 5).

The WSBW infestation in this area seems to be well established and has the potential for continued moderate to heavy defoliation for much but not all of the area in 1984. The sequential count plan for estimating egg mass densities is not calibrated for trees which have experienced two to three years of very heavy defoliation and, thus, have less foliage on branch tips on which eggs can be deposited. Therefore, egg mass densities and the potential for 1984 defoliation may be greater than the data shows for some of the areas.

Infested areas within or near the Ochoco National Forest showed 42 of 71 plots (59 percent) with two or more years of moderate to heavy defoliation with 90 percent of the plots showing at least one year of at least moderate defoliation (Table 2). The average 1983 defoliation index for this area was 4.7, indicating that about 75 percent of current year's foliage was gone.

Predictions of 1984 defoliation levels were moderate to heavy at 26 (74 percent) and light at 9 (26 percent) of the egg mass plots (Table 5).

In general, the infestation on the Ochoco National Forest is newer than that on the other three National Forests in the Blue Mountains. Also, the potential for damage in 1984 seems to be greater than in other areas sampled. This apparent potential for more damage in this area may be in part due to the fact, as mentioned before, that the sequential count plan has not been calibrated for areas with several years of very heavy defoliation.

Within or near the Umatilla National Forest 29 of 42 plots (69 percent) showed two or more years of moderate to heavy defoliation with all but one plot (2 percent) showing at least one year of moderate to heavy defoliation (Table 3). The average 1983 defoliation index of 4.9 indicates that about 75 percent or more of the current year's foliage was gone.

Egg mass densities predicted that 21 of 36 plots (58 percent) sampled would experience moderate to heavy defoliation in 1984 (Table 5).

Much of this area will apparently continue to experience significant defoliation through 1984. Once again, because of previously mentioned characteristics of the sequential count plan, the potential for 1984 defoliation may be underestimated.

Within or adjacent to the Wallowa-Whitman National Forest 47 of 90 plots (52 percent) showed two or more years of moderate to heavy defoliation with 78 percent of the plots showing at least one year of moderate to heavy defoliation (Table 4). The average 1983 defoliation index was 4.1, indicating that somewhere between 50 percent and 75 percent of the current year's foliage was gone.

Predicted defoliation levels for 1984 were moderate to heavy for 22 of 81 egg mass plots (27 percent) and light for 59 plots (73 percent) (Table 5).

When examined as a whole, this area apparently had lower levels of 1983 defoliation than areas in or adjacent to the other three National Forests. However, sampling shows that parts of some analysis units (e.g., Elkhorn, Baker Watershed, Union, Starkey, Sumpter, Sumpter Watershed) have experienced heavy defoliation over the past two or three years. Much of the area in the Dark Canyon and Johnson analysis units apparently has not experienced as much defoliation. In the Wallowa-Whitman National Forest area both lightly and heavily defoliated areas tend to have lower egg mass densities than the other three Forests, indicating that these areas may experience lower levels of defoliation in 1984 than other areas within the Blue Mountains.

Summary and Recommendations

In 1984, WSBW is expected to continue causing considerable defoliation and tree damage throughout much of the host type in the Blue Mountains of eastern Oregon. It is recommended that an analysis of this situation, including estimated losses and potential management strategies, be conducted and documented for use in deciding what course of action, if any, to take. It is also recommended that these WSBW population and damage levels be monitored during 1984 regardless of what courses of action are decided upon in order to: (1) monitor long-term effectiveness of insecticide treatment; and (2) follow the course of this outbreak in untreated areas.

Reference

Carolin, V. W. and W. K. Coulter
1972. Sampling populations of western spruce budworm and predicting defoliation in eastern Oregon. USDA For. Serv., Pac. NW For. and Range Exp. Sta., Res. Pap. PNW 149. 33 p.

Table 1.--New Egg Mass Densities, Defoliation Indices, and Predicted 1984 Defoliation Classifications for Plots Within Western Spruce Budworm-Infested Areas on or Adjacent to the Malheur National Forest.

Analysis Unit	Plot Location (Rge., Twn., Sec.)	Defoliation Index[1] 1981	1982	1983	New Egg Masses Per Square Meter of Foliage Area[2]	Predicted 1984 Defoliation Level[3]
Northside	- - -	-	-	-	-	-
Camp	12 S., 35 E. 1 NW	1	3	5	17.9	H
Flat	9 S., 31 E., 22 NW	2	4	6	21.4	H
	10 S., 30 E., 25 SW	3	5	5	22.9	H
	10 S., 31 E., 6 NE	2	3	3	5.7	L
	10 S., 31 E., 10 SW	3	5	6	31.4	H
	10 S., 31 E., 13 SW	4	5	6	2.6	L
	10 S., 31 E., 33 SE	3	5	6	15.0	H
	10 S., 32 E., 27 SW	3	4	5	4.0	L
	11 S., 30 E., 21 NE	3	4	5	3.0	L
	11 S., 31 E., 5 SW	2	3	5	10.7	M
	11 S., 31 E., 11 SW	2	4	6	5.7	L
	11 S., 31 E., 19 SW	2	3	5	12.9	H
	11 S., 31 E., 27 NW	3	5	6	4.0	L
	11 S., 31 E., 35 SE	2	3	5	5.0	L
	11 S., 32 E., 5 NE	2	2	5	4.0	L
	11 S., 32 E., 10 SW	1	2	4	14.3	H
	11 S., 32 E., 18 SE	4	6	6	5.7	L
	11 S., 32 E., 21 NW	3	5	6	15.0	H
	11 S., 32 E., 27 NW	2	5	6	9.3	M
	11 S., 32 E., 30 SE	3	5	6	5.0	L
	12 S., 31 E., 20 NW	2	4	5	4.7	L
	12 S., 32 E., 5 SW	5	6	6	21.4	H
Hamilton	10 S., 28 E., 22 SE	5	5	6	18.6	H
	10 S., 29 E., 14 NE	5	6	6	22.1	H
	10 S., 29 E., 21 NE	3	5	5	16.6	H
Belshaw	11 S., 28 E., 35 NE	3	5	6	11.4	M
	12 S., 28 E., 26 NW	2	2	3	(0.4)	L
	12 S., 29 E., 3 NW	2	3	6	15.0	H
	12 S., 29 E., 14 NE	3	4	6	7.9	M
Neck	-	-	-	-	-	
Crockett	-	-	-	-	-	
Dixie	12 S., 33 E., 2 NE	5	5	6	5.3	L
	12 S., 33 E., 5 SW	2	5	6	10.0	M
	12 S., 34 E., 6 NW	4	5	6	5.0	L
	12 S., 34 E., 9 SE	3	5	6	10.7	M
Reynolds	-	-				
Dry Creek	14 S., 30 E., 35 NW	5	6	6	6.4	M
	15 S., 31 E., 4 SW	4	5	6	21.4	H
	15 S., 31 E., 5 SW	2	4	6	22.9	H

Table 1.--Continued

Starr	15 S., 30 E., 3 NE	4	5	6	9.3	M
	15 S., 31 E., 16 NW	5	5	6	2.1	L
	15 S., 31 E., 27 NW	5	5	6	25.0	H
	15 S., 32 E., 32 NE	3	4	6	2.8	L
	16 S., 32 E., 4 NE	2	4	6	5.0	L
	16 S., 32 E., 6 NW	4	6	5	17.9	H
	16 S., 32 E., 10 SE	2	5	5	8.6	M
Lost Cabin	17 S., 29 E., 36 SW	1	1	4	3.4	L
	18 S., 28 E., 25 SW	2	3	2	5.7	L
	18 S., 29 E., 13 NW	1	2	4	5.3	L
	18 S., 30 E., 25 NE	1	3	3	7.1	M
	18 S., 30 E., 35 NW	2	2	3	9.3	M
	18 S., 31 E., 20 SE	2	3	5	11.4	M
	19 S., 28 E., 12 SE	1	1	3	4.7	L
	19 S., 30 E., 18 NE	2	2	4	7.9	M
	19 S., 31 E., 8 NE	1	1	3	5.0	L
	19 S., 31 E., 22 SE	2	4	5	11.4	M
	19 S., 31 E., 32 SE	1	2	3	5.0	L
Sawtooth	15 S., 32 E., 8 NE	3	5	6	3.6	L
	15 S., 33 E., 19 SE	3	5	6	3.6	L
	15 S., 33 E., 26 SW	3	5	6	3.6	L
	15 S., 34 E., 31 SW	3	5	5	13.6	H
	15 S., 34 E., 34 NW	2	3	6	12.1	H
	15 S., 35 E., 28 SE	1	2	2	4.3	L
	16 S., 33 E., 5 NE	3	5	6	7.9	M
	16 S., 33½ E., 12 NE	2	3	5	12.1	H
	19 S., 27 E., 24 SE	2	2	5	5.0	L
	19 S., 28 E., 15 NE	1	2	3	10.7	M
	19 S., 28 E., 22 SE	1	3	3	17.9	H
	20 S., 28 E., 12 SW	1	2	3	13.6	H
	20 S., 29 E., 5 SW	2	2	3	5.7	L
Malheur	14 S., 35½ E., 36 SW	1	2	5	14.3	H
	15 S., 36 E., 18 NE	1	2	5	11.4	M
	16 S., 35 E., 11 SE	3	5	5	10.0	M
McCoy	-	-	-	-	-	-
HR1149-6239	-	-	-	-	-	-
HR1149-6240	-	-	-	-	-	-
Strawberry Wilderness	-	-	-	-	-	-

1/ Defoliation indices for each year are based upon a 6-class system with each index number representing a certain level of defoliation on foliage produced during that specific year: 1 = 0%, 2 = 1-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-99%, 6 = 100%.

2/ Precision of 25%, numbers in parentheses did not meet the 25% precision level.

3/ Categories of predicted 1984 defoliation are: L (light) = ≤25%; M (moderate) = >25 ≤50%; H = >50%.

Table 2.--New Egg Mass Densities, Defoliation Indices, and Predicted 1984 Defoliation Classifications for Plots Within Western Spruce Budworm-Infested Areas on or Adjacent to the Ochoco National Forest.

Analysis Unit	Plot Location (Rge., Twn., Sec.)	Defoliation Index[1/] 1981	1982	1983	New Egg Masses Per Square Meter of Foliage Area[2/]	Predicted 1984 Defoliation Level[3/]
Awbrey	11 S., 16 E., 34 SE	3	4	5	10.0	M
	12 S., 16 E., 18 SE	2	4	5	10.7	M
	12 S., 16 E., 24 SW	2	4	6	7.1	M
Cougar	12 S., 18 E., 19 NW	3	4	6	21.4	H
	12 S., 18 E., 33 NW	2	4	4	11.4	M
	12 S., 19 E., 16 NW	1	1	2	4.0	L
	12 S., 19 E., 27 NW	1	2	3	2.1	L
	13 S., 17 E., 4 NE	2	4	5	9.3	M
	13 S., 17 E., 7 NE	4	4	5	12.1	H
	13 S., 17 E., 15 SE	2	4	5	25.0	H
	13 S., 17 E., 32 NE	1	2	2	7.1	M
	13 S., 18 E., 5 SW	3	5	6	15.7	H
Round	12 S., 20 E., 19 SE	2	5	6	16.4	H
	13 S., 19 E., 26 SE	1	2	3	2.8	L
	13 S., 20 E., 12 NW	1	3	5	8.5	M
	13 S., 20 E., 35 NE	2	3	5	5.0	L
	13 S., 21 E., 28 NW	2	2	4	8.6	M
Duncan	14 S., 20 E., 16 SW	2	2	2	4.0	L
	15 S., 20 E., 1 SW	2	2	3	7.1	M
	15 S., 20 E., 2 NE	2	5	6	37.9	H
Sheep	-	-	-	-	-	-
Maury	-	-	-	-	-	-
Peterson	12 S., 21 E., 28 SW	2	4	5	7.1	M
	12 S., 22 E., 34 SW	2	4	5	6.4	M
	13 S., 21 E., 24 SE	3	5	6	4.7	L
	13 S., 22 E., 32 NW	2	3	6	10.0	M
	14 S., 22 E., 3 NE	2	3	4	8.6	M
	14 S., 23 E., 18 SW	1	3	4	4.7	L
Wolf	13 S., 23 E., 13 SE	-	-	4	2.6	L
	13 S., 24 E., 2 NW	2	3	6	10.7	M
	14 S., 24 E., 8 SW	1	1	2	5.0	L
	14 S., 24 E., 23 NW	2	3	5	18.6	H
	14 S., 25 E., 1 SE	1	3	6	10.0	M
	14 S., 25 E., 5 SW	2	3	5	10.7	M
	14 S., 25 E., 21 SW	1	2	5	10.0	M
Sugarloaf	-	-	-	-	-	-
Mowich	18 S., 26 E., 35 SW	3	5	5	21.4	H
	19 S., 27 E., 16 NE	2	3	5	9.3	M
HR1149-6212	-	-	-	-	-	-

1/ Defoliation indices for each year are based upon a 6-class system with each index number representing a certain level of defoliation on foliage produced during that specific year: 1 = 0%, 2 = 1-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-99%, 6 = 100%.

2/ Precision of 25%, numbers in parentheses did not meet the 25% precision level.

3/ Categories of predicted 1984 defoliation are: L (light) = $\leq$25%; M (moderate) = >25 $\leq$50%; H = >50%.

Table 3.--New Egg Mass Densities, Defoliation Indices, and Predicted 1984 Defoliation Classifications for Plots Within Western Spruce Budworm-Infested Areas on or Adjacent to the Umatilla National Forest.

Analysis Unit	Plot Location (Rge., Twn., Sec.)	Defoliation Index[1] 1981	1982	1983	New Egg Masses Per Square Meter of Foliage Area[2]	Predicted 1984 Defoliation Level[3]
Summerfield	4 S., 28 E., 2 SE	3	4	5	7.1	M
	4 S., 28 E., 22 SW	2	5	4	5.0	L
	4 S., 28 E., 9 SE	3	5	6	1.5	L
	4 S., 29 E., 17 NW	2	5	4	17.1	H
	4 S., 29 E., 18 SE	3	3	3	6.4	M
	5 S., 27 E., 5 NE	3	5	6	1.6	H
	5 S., 27 E., 7 SE	3	5	6	5.7	L
	5 S., 27 E., 12 NE	4	5	5	7.1	M
Hascal	2 S., 33 E., 25 NE	1	1	3	(0.5)	L
	3 S., 31 E., 12 SW	2	4	5	25.7	H
	3 S., 31 E., 21 SW	4	5	6	2.6	L
	3 S., 31 E., 25 NW	2	5	6	20.7	H
	3 S., 31 E., 36 NE	2	4	6	8.6	M
	3 S., 32 E., 1 NE	2	3	5	19.3	H
	3 S., 32 E., 5 NE	1	1	2	(0.0)	L
	3 S., 32 E., 9 SE	2	3	5	3.4	L
	3 S., 33 E., 14 SE	2	3	5	9.3	M
	3 S., 33 E., 17 SE	4	4	6	(0.0)	L
	3 S., 33½ E., 22 SE	1	2	5	10.0	M
	4 S., 32 E., 6 NW	3	5	6	12.5	H
	4 S., 33 E., 5 SW	2	2	6	13.6	H
	4 S., 33 E., 33 NE	2	3	5	12.1	H
	4 S., 33½ E., 3 SE	1	1	3	3.1	L
	4 S., 34 E., 7 SW	1	1	3	5.0	L
Dale	5 S., 32 E., 35 NW	2	5	6	13.6	H
	5 S., 33 E., 15 NE	1	3	5	6.4	M
	5 S., 33 E., 21 SE	1	2	3	3.5	L
	5 S., 33 E., 22 SE	2	4	5	2.1	L
	5 S., 33 E., 35 SE	2	3	4	12.1	H
	5 S., 33½ E., 2 SW	1	3	3	7.1	M
	6 S., 33 E., 21 NW	3	4	6	5.7	L
	6 S., 33 E., 31 NE	3	4	5	7.1	M
	6 S., 33 E., 35 SW	1	1	5	6.4	M
	7 S., 33 E., 5 NE	1	3	5	5.0	L
	7 S., 33 E., 7 NW	1	2	5	13.6	H
	7 S., 33 E., 21 NE	1	2	3	5.0	L
HR1149-6251	-	-	-	-	-	-
HR1149-6252	-	-	-	-	-	-
HR1149-6253	-	-	-	-	-	-
HR1149-6256	-	-	-	-	-	-

1/ Defoliation indices for each year are based upon a 6-class system with each index number representing a certain level of defoliation on foliage produced during that specific year: 1 = 0%, 2 = 1-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-99%, 6 = 100%.

2/ Precision of 25%, numbers in parentheses did not meet the 25% precision level.

3/ Categories of predicted 1984 defoliation are: L (light) = ≤25%; M (moderate) = >25 ≤50%; H = >50%.

Table 4.--New Egg Mass Densities, Defoliation Indices, and Predicted 1984 Defoliation Classifications for Plots Within Western Spruce Budworm-Infested Areas on or Adjacent to the Wallowa-Whitman National Forest.

Analysis Unit	Plot Location (Rge., Twn., Sec.)	Defoliation Index[1] 1981	1982	1983	New Egg Masses Per Square Meter of Foliage Area[2]	Predicted 1984 Defoliation Level[3]
Dark Canyon	2 S., 36 E., 29 SW	1	1	2	(1.5)	L
	3 S., 34 E., 9 SE	2	2	2	2.9	L
	3 S., 35 E., 5 SE	1	2	2	(0.4)	L
	3 S., 35 E., 8 SW	2	3	2	(0.4)	L
	3 S., 35 E., 11 NW	1	2	2	6.1	L
	3 S., 35 E., 14 NW	1	2	2	0.5	L
Johnson	3 S., 38 E., 19 NW	1	2	5	3.1	L
	4 S., 35 E., 26 NE	1	1	4	9.3	M
	4 S., 35 E., 31 SE	3	5	6	15.0	H
	4 S., 36 E., 22 NW	1	2	1	2.1	L
	4 S., 36 E., 31 NE	1	2	4	7.1	M
	4 S., 36 E., 34 NW	1	1	2	2.1	L
	4 S., 37 E., 32 SW	1	2	2	3.4	L
	4 S., 38 E., 27 SE	2	2	5	2.8	L
	4 S., 38 E., 30 NE	3	4	4	5.0	L
	5 S., 34 E., 12 SE	1	1	2	2.1	L
	5 S., 35 E., 7 SE	1	1	4	2.0	L
	5 S., 35 E., 10 NW	1	2	2	3.8	L
	5 S., 35 E., 17 NW	1	2	2	2.1	L
	5 S., 35 E., 23 NE	2	3	3	2.1	L
	5 S., 37 E., 36 SW	1	1	1	(0.0)	L
	5 S., 38 E., 35 SE	4	6	6	2.8	L
	5 S., 38 E., 8 NE	2	3	5	5.0	L
	5 S., 38 E., 9 SE	2	3	6	15.0	H
	5 S., 38 E., 19 SW	1	2	3	3.2	L
	5 S., 38 E., 27 SW	3	5	6	1.5	L
	6 S., 37 E., 11 NW	2	2	3	3.1	L
	6 S., 37 E., 25 SW	2	3	5	(1.5)	L
	6 S., 37 E., 26 NW	1	1	2	(0.0)	L
	6 S., 38 E., 4 SE	2	3	4	14.3	H
	6 S., 38 E., 7 SW	2	2	5	6.4	L
	7 S., 37 E., 1 NW	1	2	1	(0.0)	L
LaGrande Watershed	-	-	-	-	-	-
Limber Jim	-	-	-	-	-	-
Elkhorn	7 S., 37 E., 12 SE	1	1	3	5.0	L
	7 S., 38 E., 5 SW	1	3	3	6.4	M
	7 S., 38 E., 17 SW	1	3	2	7.1	M
	7 S., 38 E., 29 SE	3	5	6	17.9	H
	7 S., 38 E., 5 SW	3	5	6	2.0	L
	8 S., 38 E., 23 SW	4	5	5	6.2	M
	9 S., 38 E., 12 SW	4	5	6	2.0	L
	9 S., 39 E., 18 NE	2	4	5	5.7	L
	9 S., 39 E., 33 NW	3	5	6	7.9	M
Baker Watershed	9 S., 38 E., 14 NW	1	3	5	5.0	L
Sumpter Watershed	9 S., 36 E., 24 NE	1	2	3	4.0	L
Dooley	-	-	-	-	-	-

Table 4 Continued

Unity	10 S., 35½ E., 36 NW	4	4	3	4.0	L
	12 S., 36 E., 11 SW	3	3	5	10.7	M
	13 S., 36 E., 6 SW	1	2	2	9.3	M
Union	3 S., 40 E., 36 SE	4	6	6	(1.5)	L
	3 S., 41 E., 29 NW	5	5	6	(0.5)	L
	4 S., 41 E., 20 NE	2	4	6	2.6	L
	4 S., 41 E., 34 NE	2	3	5	5.7	L
	5 S., 41 E., 4 SW	1	1	2	3.8	L
	5 S., 41 E., 11 SE	2	4	6	12.1	H
	5 S., 41 E., 20 NE	2	2	3	4.7	L
	5 S., 41 E., 28 SW	3	3	5	3.1	L
	5 S., 41 E., 30 NW	2	3	5	16.4	H
	5 S., 41 E., 35 NE	2	2	5	2.8	L
	5 S., 42 E., 8 SW	2	3	5	3.1	L
	5 S., 42 E., 29 NE	2	2	5	(1.0)	L
	6 S., 41 E., 9 NW	3	4	6	4.7	L
	6 S., 42 E., 16 SW	1	2	2	(0.4)	L
	6 S., 43 E., 5 NW	2	2	2	(0.0)	L
Starkey	3 S., 34 E., 14 SW	2	3	5	2.1	L
	4 S., 34 E., 2 NE	2	5	5	18.6	H
	4 S., 34 E., 33 SE	-	-	3	5.7	L
	4 S., 34 E., 35 NW	2	4	5	24.3	H
Sumpter	9 S., 35½ E., 1 SE	2	5	3	5.7	L
	9 S., 37 E., 5 SW	1	5	5	4.7	L
	9 S., 37 E., 15 SW	1	2	3	6.4	M
	9 S., 38 E., 16 SW	2	3	6	(0.0)	L
	9 S., 38 E., 21 NW	2	3	6	6.4	M
	9 S., 38 E., 27 NE	3	6	6	4.0	L
	9 S., 38 E., 30 NW	2	4	5	7.9	M
	9 S., 38 E., 35 NE	3	5	6	15.7	H
	10 S., 35 E., 15 SW	1	2	3	5.0	L
	10 S., 35 E., 23 SW	1	3	5	15.0	H
	10 S., 35½ E., 16 SE	1	2	5	11.4	M
	10 S., 35½ E., 23 SW	2	5	2	6.0	L
	10 S., 36 E., 5 SE	1	2	2	5.7	L
	10 S., 38 E., 1 NE	3	5	6	5.0	L
	10 S., 38 E., 11 NE	2	5	4	5.0	L
HR1149-6273	-	-	-	-	-	
HR1149-6275	-	-	-	-	-	
HR1149-6281	6 S., 42 E., 11 SW	3	4	5	2.0	L

1/ Defoliation indices for each year are based upon a 6-class system with each index number representing a certain level of defoliation on foliage produced during that specific year: 1 = 0%, 2 = 1-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-99%, 6 = 100%.

2/ Precision of 25%, numbers in parentheses did not meet the 25% precision level.

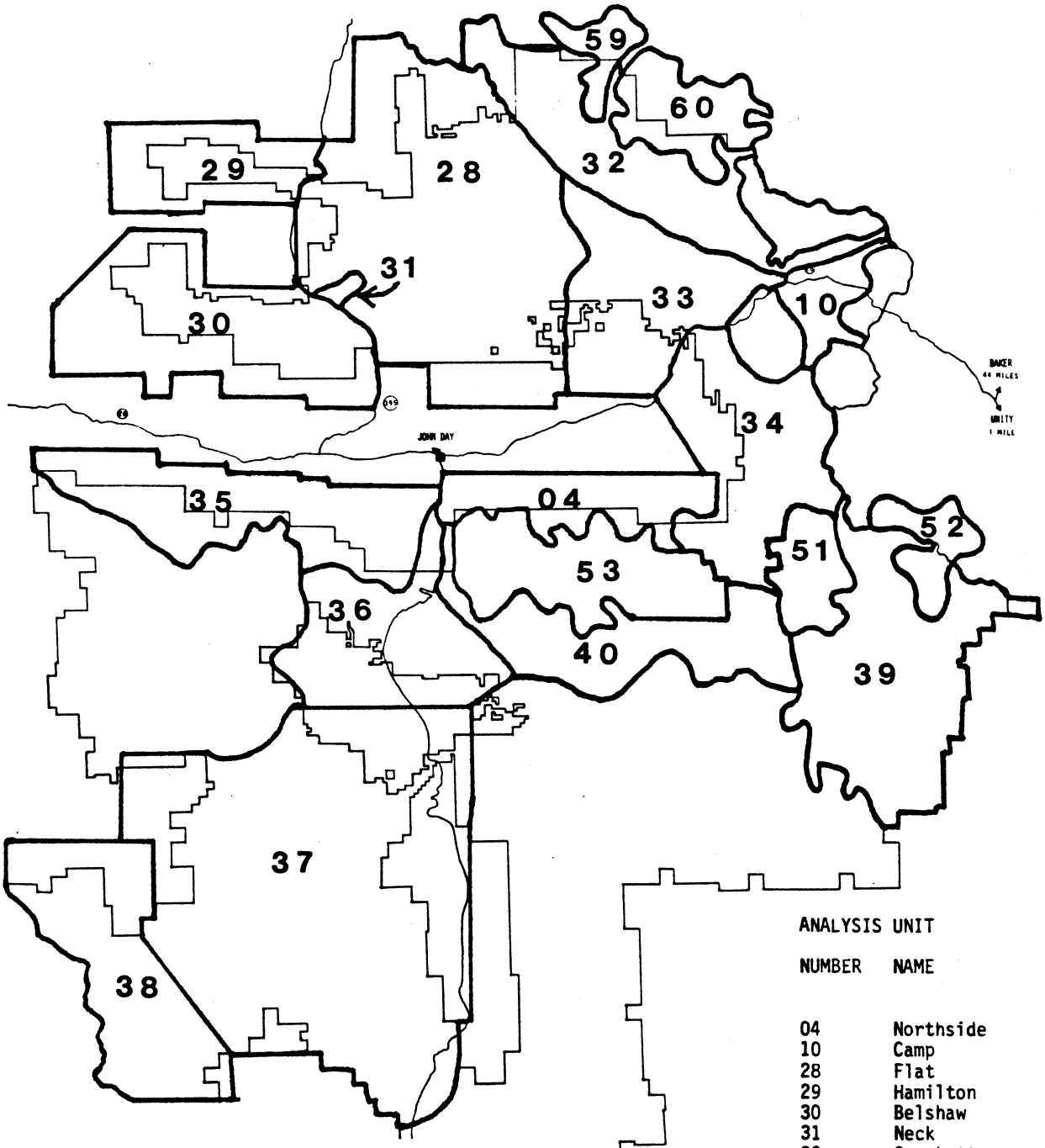
3/ Categories of predicted 1984 defoliation are: L (light) = <25%; M (moderate) = >25 ≤50%; H = >50%.

Table 5.--Percentages of Western Spruce Budworm Defoliation Plots with Zero, One or More, or Two or More Years of Moderate to Heavy Defoliation and Percentages of Egg Mass Plots Predicting Light or Moderate to Heavy 1984 Defoliation, Blue Mountains of Eastern Oregon, 1983

National Forest	No. of Defoliation Plots	Percent Plots by Years of Moderate to Heavy Defoliation			No. of Egg Mass Plots	Percent Plots by Predicted 1984 Defoliation Level	
		0	1	2		Light	Moderate to Heavy
Malheur	185	2	98	83	70	59	41
Ochoco	71	10	90	59	35	26	74
Umatilla	42	2	98	69	36	42	58
Wallowa-Whitman	90	22	78	52	81	73	27

MALHEUR

NATIONAL FOREST

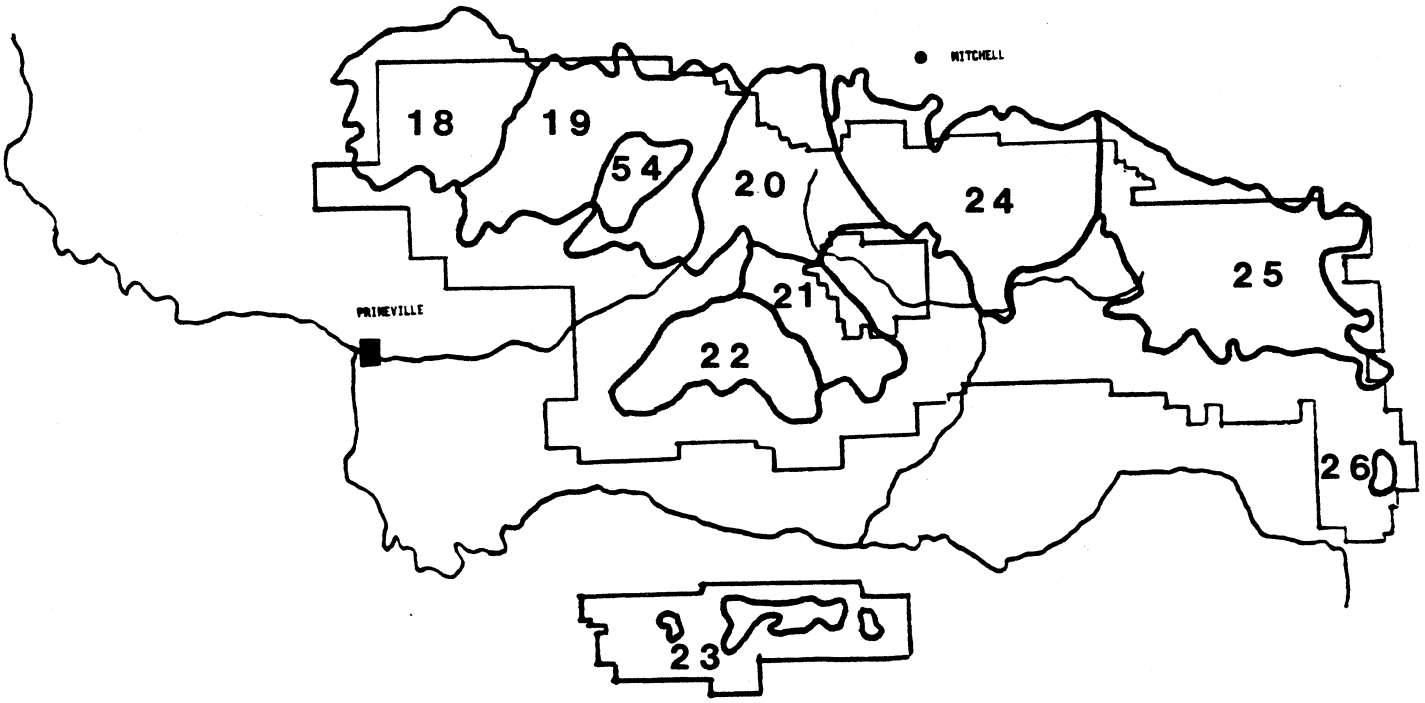


ANALYSIS UNIT

NUMBER	NAME
04	Northside
10	Camp
28	Flat
29	Hamilton
30	Belshaw
31	Neck
32	Crockett
33	Dixie
34	Reynolds
35	Dry Creek
36	Starr
37	Lost Cabin
38	Sawtooth
39	Malheur
40	McCoy
51	HR 1149 6239
52	HR 1149 6240
53	Strawberry Wilderness

Figure 1.--Western Spruce Budworm Analysis Units on the Malheur National Forest and Adjacent State and Private Lands, 1983.

OCHOCO
National Forest



ANALYSIS UNIT

NUMBER	NAME
18	Awbrey
19	Cougar
20	Round
21	Duncan
22	Sheep
23	Maury
24	Peterson
25	Wolf
26	Sugarloaf
27	Mowich
54	1149 6212

Figure 2.--Western Spruce Budworm Analysis Units on the Ochoco National Forest and Adjacent State and Private Lands, 1983.

Figure 3.--Western Spruce Budworm Analysis Units on the Umatilla National Forest and Adjacent State and Private Lands, 1983.

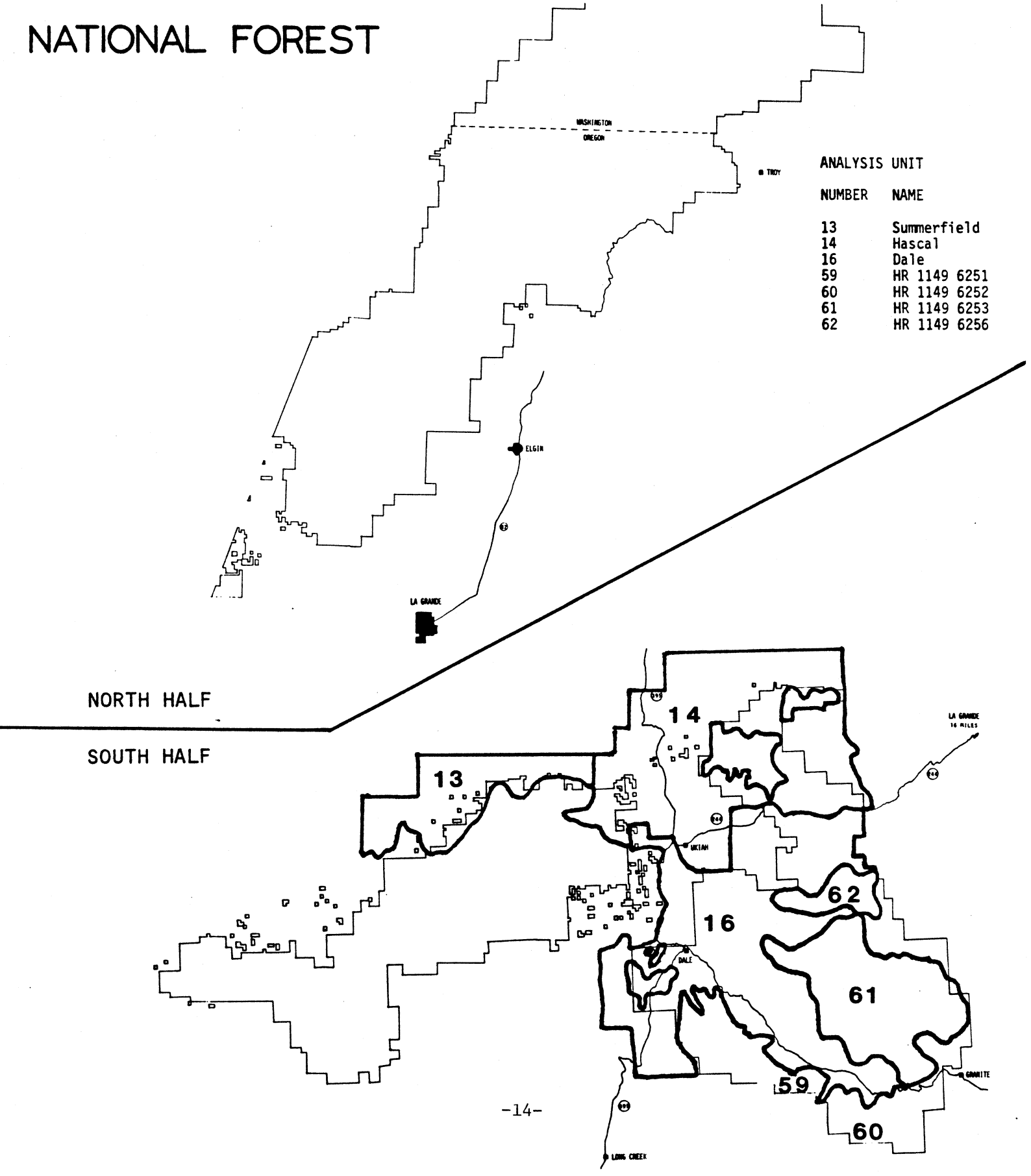
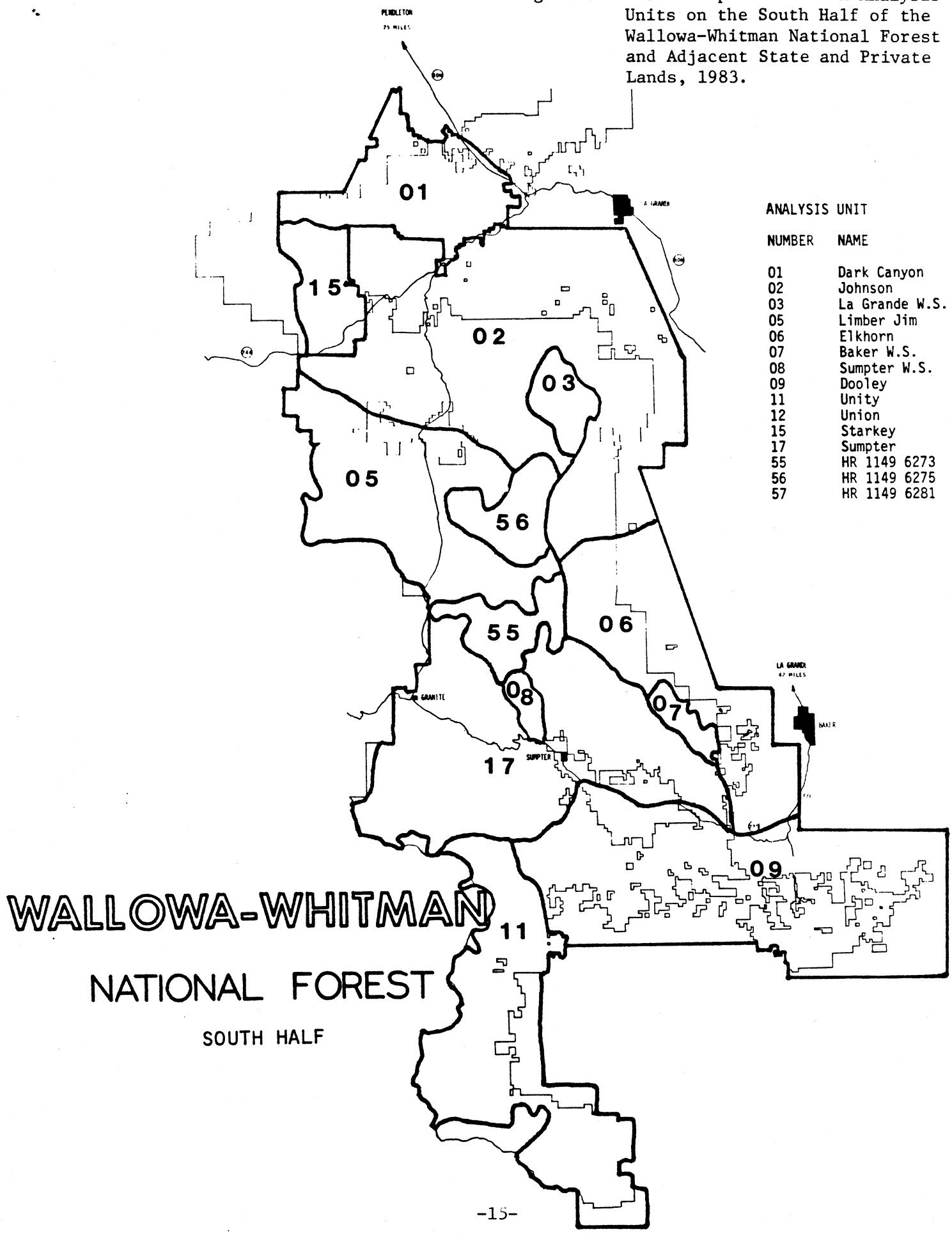


Figure 4.--Western Spruce Budworm Analysis Units on the South Half of the Wallowa-Whitman National Forest and Adjacent State and Private Lands, 1983.



ANALYSIS UNIT

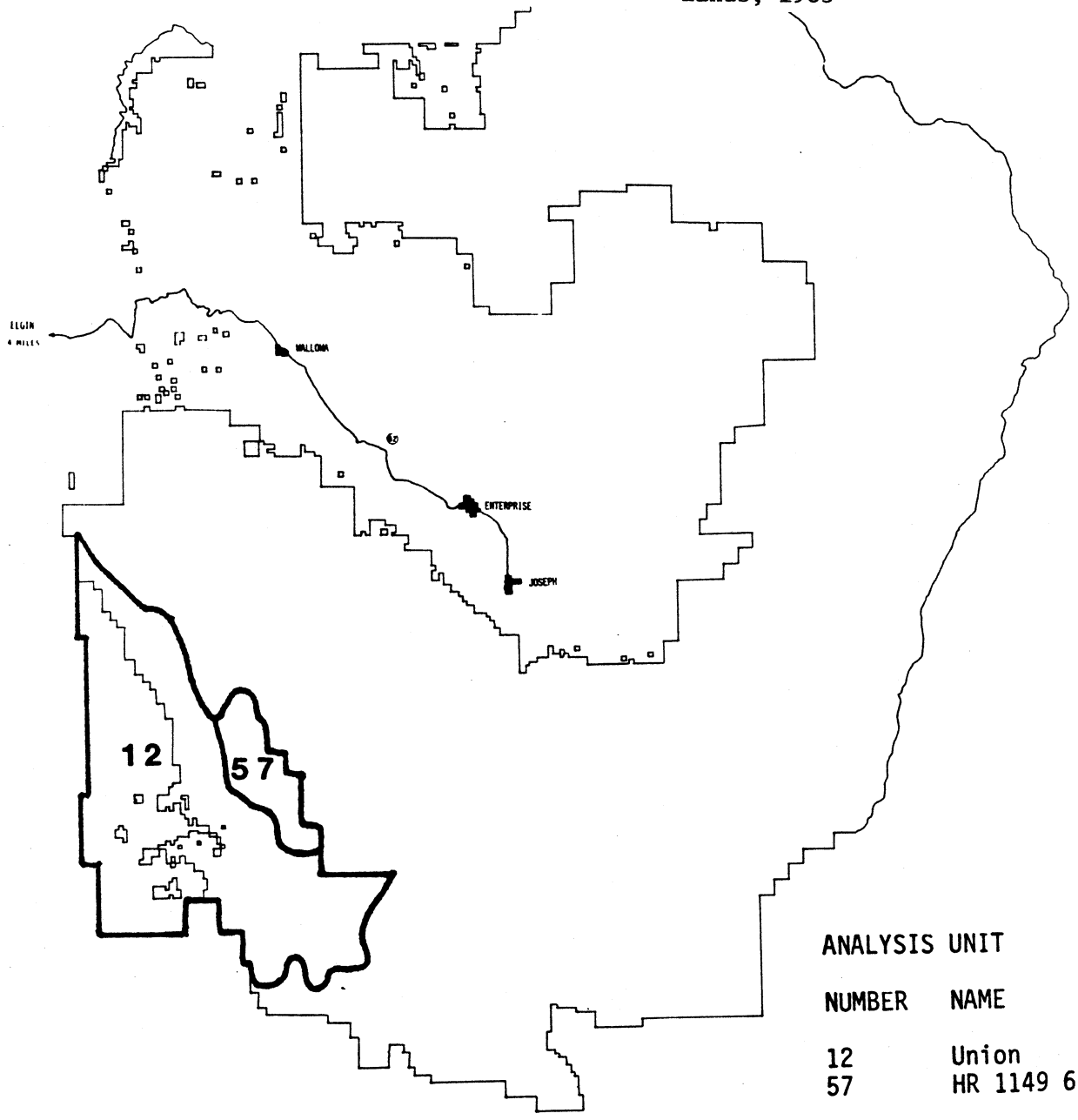
NUMBER	NAME
01	Dark Canyon
02	Johnson
03	La Grande W.S.
05	Limber Jim
06	Elkhorn
07	Baker W.S.
08	Sumpter W.S.
09	Dooley
11	Unity
12	Union
15	Starkey
17	Sumpter
55	HR 1149 6273
56	HR 1149 6275
57	HR 1149 6281

WALLOWA-WHITMAN

NATIONAL FOREST

NORTH HALF

Figure 5.--Western Spruce Budworm Analysis Units on the North Half of the Wallowa-Whitman National Forest and Adjacent State and Private Lands, 1983



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